The Warfighter Nutrition Guide

9

Secrets to Keeping Lean as a Fighting Machine

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9 Secrets to Keeping Lean as a Fighting Machine

In This Chapter

Key Points

- Consumption of carbohydrate (CHO) in defined amounts is the most important fuel strategy for all forms of exercise.
- Depletion of glycogen stores will result in poor performance in the weight room and endurance training sessions, such as a pack run.
- Improper nutrient intake and low muscle glycogen stores may increase the risk of musculoskeletal injuries.
- CHO ingestion improves the use of amino acids when they are ingested together.
- Drinking too much plain water can pose performance pitfalls during prolonged missions/exercise sessions that involve constant movement.
- Individual food preferences should be determined to avoid gastrointestinal distress during training and operations.

Warfighters must be in excellent physical condition to endure arduous physical tasks for extended periods. Endurance capacity can be greatly improved by regular physical conditioning, but it is maintained by sound nutritional practices. This chapter will discuss key dietary nuances to delay fatigue and reduce the risk of injury during and after training and/or missions. A well-fueled machine will work to its full capability and capacity; one that is inadequately fueled will not.

Fueling the Machine

Prolonged running, swimming, load carrying and/or multiple short bouts of high intensity activity, imposes significant demands on energy stores. The primary source of energy for sustained (and resistance) exercise is carbohydrate (CHO); without adequate CHO, performance goals cannot be achieved. Failure to consume enough CHO may result in:

- Fatigue.

- Poor performance.
- Irritability.
- Poor sleep patterns.
- Musculoskeletal injuries.

Glycogen is composed of many glucose molecules linked together.

Glycogen (our storage form of CHO) in liver and muscle is the primary source of glucose/energy for muscles (and brain) during prolonged activities. To optimize endurance performance, muscle and liver glycogen stores must be maintained. The ability to sustain performance will decrease markedly when glycogen stores are depleted: Exhaustion is certain when this happens.

Carbohydrates and the Fighting Machine

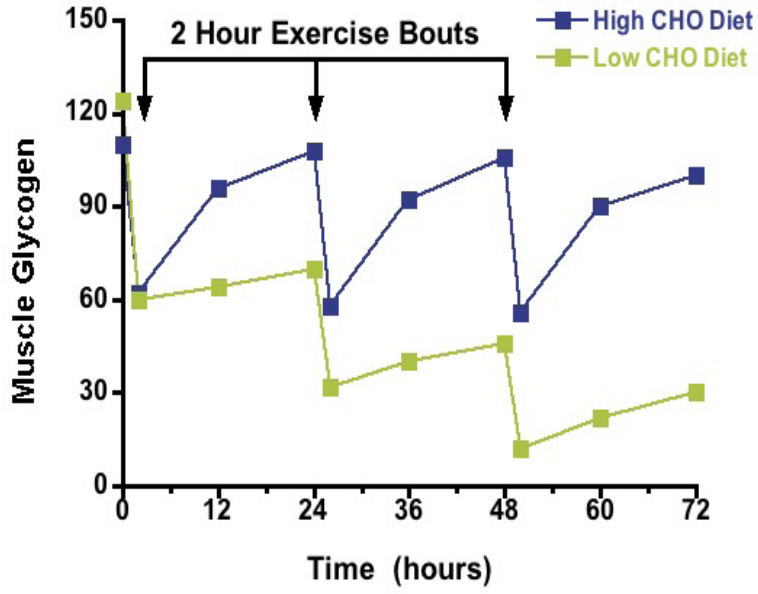
Optimizing glycogen stores is a special challenge for military personnel under sustained operations, be it during training or a mission. The most practical strategy, whenever possible, is to eat small high CHO meals frequently; this also avoids the possible discomfort of large meals. A small meal is particularly important in the morning, when liver stores may be low from not having eaten for several hours. Breaking the fast (breakfast) with a good source of CHO is critical to maintaining blood glucose and liver and muscle glycogen stores.

CHO is the most important energy-providing nutrient for endurance training.

The timing and frequency of CHO intake at various times of the day and training are crucial determinants for optimizing glycogen stores. The process is cyclical: CHO should be ingested immediately after exercise to promote muscle and liver glycogen repletion, at various times before exercise (breakfast), and at multiple intervals throughout the day. Frequent CHO ingestion will ensure a readily available source of fuel as glycogen stores become depleted.

CHO and Endurance

The figure below illustrates patterns of muscle glycogen depletion over three days, when exercising two hours per day. Subjects on a low CHO diet gradually depleted their glycogen stores over the three-day period, whereas glycogen stores were repleted between training sessions on a high CHO diet. The need to consume foods high in CHO is clear.



Eat 2.5–6 grams CHO per pound of body weight daily, depending on the duration of the training session.

Click here to calculate your CHO needs per day.

Another way to think about CHO needs is in terms of energy intake. Typically, 50–70% of daily energy intake should come from CHO, and at a minimum, 400 grams of CHO should be consumed each day to ensure adequate glycogen stores. A diet providing 55% of the daily energy intake needed will almost always provide 400 grams of CHO. When energy intake is greater than 4,000 kcals, energy needs should be met by increasing fat intake. Recommendations for approximate gram amounts of CHO, protein, and fat for various energy levels are presented in Table 9–2.

Table 9–1. Ranges of CHO Intake for Varying Duration of Endurance Training Sessions

Exercise Time (hrs/day)	Carbohydrate (g/lb body weight)
1	2.5–4
2	3–4
3	4–5
4	4–6

Example:

Weight = 175 lbs and training is one hour each day.

2.5 x 175 kg = 437 grams of CHO

4 x 175 kg = 650 grams of CHO

CHO needs are between 437 and 650 grams per day.

CHO intake over 24 hours will typically not exceed 650 grams.

Example:

Train 3 hrs each day and take in 3,500 kcal/day

60% of energy from CHO = 3,500 x 0.60 = 2,100 kcal from CHO

Amount of CHO = 2,100/4 kcal = 525 grams of CHO

Table 9–2. Approximate Number of Grams of CHO, Protein and Fat for Various Energy Intake Levels During Sustained High-Tempo Operations

Energy Level (kcal)	CHO (g)	Protein (g)	Fat (g)
3,000	450	120	80
3,500	525	135	100
4000	600	150	110
4500	625	165	150
5000	650	180	190

Because each gram of CHO provides 4 kcal, the number of grams of CHO needed can be easily calculated from energy intake. A list of various high CHO foods and the grams of CHO provided by each food is provided in Chapter 5. Complex CHO foods are preferred since they also provide vitamins and minerals in addition to CHO (see Chapter 4). Other important recommendations include:

Eat high CHO snacks *between* training sessions to replenish glycogen stores.

Consume at least 50 grams of CHO with 10–12 grams of protein immediately *after* completing a training session.

Fluid replacement beverages and a sports bar are great during recovery from long training sessions because they supply CHO, water, protein, electrolytes, vitamins and minerals.

Click here for examples of meal replacement beverages and high CHO sports bars.

Keep a log of all CHO foods eaten for several days to determine if CHO intake is high enough.

Protein Needs

Although protein requirements are higher for endurance training than a sedentary lifestyle, rarely is military personnel lacking in protein. Most diets provide far more than what is needed.

Maintaining a positive energy balance is more important than increasing protein intake for both endurance and resistance exercise training.

Importantly, if protein intake is high, and eaten at the expense of CHO, glycogen stores may be reduced and performance compromised. Protein requirements were calculated in Chapter 3 so refer to that chapter for more information. However, in general:

Protein intakes should range from 0.6–0.9 grams per lb body weight/day.

A number of factors will determine the response of the body to the ingestion of protein. These include:

- Composition of the ingested protein.
- Metabolic state: exercise or rest.
- Presence of other nutrients.
- Timing of ingestion relative to exercise.
- Interactions among all the factors above.

It is well accepted that the composition of the ingested protein is more important than the quantity. For example, amino acids (protein) from animal proteins (e.g., milk) may be superior to plant proteins. After resistance exercise skeletal muscles take up amino acids from milk proteins (such as whey and casein) faster than from soy protein. Also, during the resting state, casein protein appears to produce a stronger "anabolic" environment than whey protein. This is because the amino acids from casein are absorbed more slowly so that blood levels are elevated over a long period of time. After resistance exercise, muscles take up similar amounts of amino acids from casein and whey.

Ingesting other energy sources in combination with protein also affects how rapidly the whole body and skeletal muscles take up amino acids. At rest, the body seems to retain more amino acids when the protein is con-

sumed with CHO. Also, CHO ingestion improves the use of amino acids when they are ingested together after resistance exercise. Importantly, a small amount of the essential amino acids together is more effective than large amounts of protein. The timing of protein ingestion is critical.

Finally, it is unreasonable to give broad recommendations for a particular amount of protein for Warfighters given all the important regulating and interacting factors. However, more is **not** better.

Click to calculate grams needed of CHO, protein, and fat based on energy needs.

Vitamin and Mineral Needs

Currently, the micronutrient requirements for endurance training are not well defined. Because of the nature of your training, daily overall needs may be 1.5–3 times greater than the average man. If a healthy diet composed of a variety of different foods that meets your energy requirements is consumed, daily vitamin and mineral needs should be met (see Chapter 4 for information on food sources of various vitamins and minerals). Because endurance exercise may increase the need for antioxidants due to increases in free radical exposure and cellular breakdown, it is recommended that several foods rich in natural antioxidants (vitamin C, vitamin E and beta carotene) be consumed, as shown in the table below.

Table 9–3. Some Good Food Sources of Selected Antioxidant Nutrients

Vitamin C	Vitamin E	Carotenoids
Orange juice	Sunflower seeds	Carrots
Grapefruit juice	Wheat germ	Spinach
Broccoli	Almonds	Cantaloupe
Orange	Peanuts	Broccoli
Strawberries	Spinach	Winter squash
Cauliflower	Olive oil	Dried apricots
Red, yellow peppers	Tomato	Sweet potatoes
Papaya	Kiwi	Mango
Dried berries	Mango	Pumpkin

One important consideration is electrolyte (sodium and potassium) balance, particularly when training in hot weather. Adequate sodium is usu-

ally not a problem, unless you are on a sodium-restricted diet. However, potassium requires careful selection of foods. See Chapter 4 for good food sources of potassium or click here for food sources of minerals.

Fluid Requirements

Ingesting fluids at regular intervals and eating foods with high water content are important for maintaining hydration and fluid status during training. Chapter 3 provides a thorough overview of fluid requirements and different types of beverages. In general:

- Drink one to two cups (8–16 oz) of water 60 minutes before a training session.
- Drink one cup (8 oz) of a 5–8% CHO drink every 30 minutes during exercise lasting more than 60 minutes. This translates into 50–80 grams of CHO/Liter or 9–19 grams/8 oz (Read the Nutrition Label to determine the amount of CHO per serving).
- To avoid stomach cramps, beverages with a CHO content over 8%, such as undiluted fruit juices, most energy drinks, and regular sodas, should not be ingested during exercise.
- Commercial fluid replacement beverages or diluted juices are recommended during training session lasting over 60 minutes.
- Beverages consumed after prolonged exercise should contain sodium, potassium, and CHO.

It is possible to drink too much water.

Water intoxication is a concern among Warfighters and other athletes who sustain long bouts of exercise without replenishing important electrolytes contained in sports drinks, gels, and blocks. When drinking plain water (without sodium), blood levels of sodium may become low and result in "hyponatremia," or low blood sodium. This condition is associated with severe headaches, diarrhea and nausea and, potentially, convulsions and death.

Nutritional Interventions for Endurance

Nutritional manipulations/interventions can delay fatigue and prevent conditions detrimental to health and performance such as low blood sugar, dehydration, and low blood sodium. The primary interventions include:

- Drinking 1–2 cups of a CHO beverage (5-8%) with electrolytes every 30 minutes during exercise to maintain performance.
- When an activity has been maintained for 2–3 hours without a CHO source, blood glucose levels will fall and cause fatigue. Ingestion of CHO beverages will prevent the fall in blood sugar (glucose) and delay fatigue. Ingesting CHO **after** exhaustion will not allow immediate resumption of activities.
- Solid CHO foods, such as fruits, and energy and sports bars, are acceptable during exercise, provided they are tolerated. Food selections are personal choices, but some foods may cause stomach cramps and diarrhea if eaten during exercise. Dietary fiber intake should be limited during endurance exercise to avoid gastrointestinal discomfort and possible pitstops in the woods for relief. All foods used for replenishment during sustained operations and exercise sessions should be "familiar" foods.

Dietary manipulations should be tested during training to ensure they are tolerated during operations.

"I've seen firsthand how the combination of core physical training and proper nutrition enable [Warfighters] to take an unbelievable beating, stay mentally sharp, and accomplish the mission over long ranges in incredible sea states; and then do it again the next night."

CAPT Kent Paro, USN
Former CO NSWSBT20